REMARKS

The examiner rejects claims 1, 3, 4, 6, 8, 9, 15 and 16 under 35USC102(b) as being anticipated by US 6,064,486 (Chen). The examiner rejects claims 1-18 under 35USC103(a) as being unpatentable over Chen, and US 6,172,365 (Hiroi) in view of US 6,501,077 (Sawahata).

Response to the 35USC102(b) rejection

It is submitted that claims 1, 3, 4, 6, 8, 9, 15 and 16 of U.S patent application serial number 10/691,746 are clearly distinguish from the teaching of Chen and represent a non-obvious invention.

U.S patent application serial number 10/691,746 describes a method and a system that detect overlay errors by illuminating an inspected object that has a first feature formed on a first layer, a second feature formed on a second layer, wherein the <u>second feature is buried under the first layer</u>. According to a first embodiment of the invention the second feature can affect the shape of an area of the first layer and that area is illuminated. According to another embodiment of the invention the second feature is illuminated. Overlay errors can be detected by examining the relative displacement between the first feature and the second feature (see, for example, paragraphs 0067 and 0072).

Chen describes an overlay method and system that is based upon locating a **single** <u>alignment mark that can be buried under a coating layer</u>, such as a transparent CMP coating layer. (Chen, column 2, lines 7-12, 15-27, 58-64; Column 5, line 56- column 6, line 8; FIG. 2A, FIG. 2B). Referring to FIG. 2B - a **single** alignment mark (11') is positioned below coating layer 21'. Referring to FIG. 2A – a single alignment mark (11) is positioned below coating layer 21. **The coating layer does not include another feature.** Chen does not examine the relative displacement between the alignment mark and the coating layer.

Chen indicates that it provides a solution to alignment mark asymmetry (Chen, column 1, line 64 - column 2, line 12) by building an alignment mark model that can compensate (among other things) for alignment mark asymmetries.

Independent claim 1 of U.S patent application serial number 10/691,746 reads as follows:

A method for detecting overlay errors, the method comprising the steps of: directing a primary electron beam to interact with an inspected object; whereas the inspected object comprises a <u>first feature formed on a first layer of the inspected object</u> and a <u>second feature formed on a second layer of the object, wherein the <u>second feature is buried under the first layer</u>

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and wherein the <u>second feature affects a shape of an area of the first layer</u>; detecting electrons reflected or scattered from the area of the first layer; and receiving detection signals from at least one detector and determining overlay errors.

Chen does not disclose a stage of directing a primary electron beam to interact with an inspected object that includes a first feature formed on a first layer and second feature formed on a second layer wherein the second feature is buried under the first layer and affects a shape of an area of the first layer. Chen discloses a single feature that may be covered by a coating layer.

Accordingly, claim 1 should be allowed. Claims 3 and 4 depend upon claim 1, thus they also should be allowed.

Independent claim 6 of U.S patent application serial number 10/691,746 reads as follows:

A method for detecting overlay errors, the method comprising the steps of: directing a primary electron beam to interact with a first feature and a second feature of an inspected object; whereas the first feature is formed on a first layer of the inspected object and the second feature formed on a second layer of the object, wherein the second feature is buried under the first layer; detecting electrons reflected or scattered from the first and second features; and receiving detection signals from at least one detector and determining overlay errors.

Chen does not disclose a stage of directing a primary electron beam to <u>interact with a first feature and a second (buried) feature of an inspected object</u>, wherein the first feature is formed on a first layer and the second feature is formed on a second layer and <u>detecting signals from the first and second features</u>. Chen discloses a single feature that may be covered by a coating layer.

Accordingly, claim 6 should be allowed. Claims 8 and 9 depend upon claim 6, thus they also should be allowed.

Independent claim 15 of U.S patent application serial number 10/691,746 reads as follows:

A system for detecting overlay errors, the system comprises: means for directing a primary electron beam to interact with <u>a first feature and a second feature</u> of an inspected object; whereas the <u>first feature is formed on a first layer</u> of the inspected object and the <u>second feature formed on a second layer</u> of the object, wherein the <u>second feature is buried under the first layer</u>; at least one detector for detecting electrons reflected or scattered from the first and second features; and a processor, coupled to the at least one detector, for receiving detection signals from at least one detector and determining overlay errors.

Chen does not disclose a system that includes means for directing a primary electron beam to interact with a first feature and a second feature of an inspected object, whereas the first feature is formed on a first layer of the inspected object and the second feature formed on a second layer of the object, wherein the second feature is buried under the first layer.

Chen discloses a single feature that may be covered by a coating layer.

Accordingly, claim 15 should be allowed. Claim 17 depends upon claim 15, thus it also should be allowed.

Response to the 103(a) rejection

It is submitted that claims 1-18 U.S patent application serial number 10/691,746 are clearly distinguishable from the teaching of Chen and Hiroi in view of Sawahata.

Hiroi and Sawahta do not disclose overlay error measurements systems or methods. Hiroi and Sawahata do not describe in details an illuminated object and especially do not describe illuminating an inspected object that includes the first and second layers, the first and second features and the specific configuration as claimed in any of claims 1-18 of U.S patent application serial number 10/691,746.

Sawahta discloses a scanning electron microscope of a certain configuration that can collect low angle electrons. Hiroi discloses the effects of scanning an object made of different materials. The structure described by Hiroi (Hiroi, FIG. 3, FIG. 7) includes two layers, but the lower layer is not buried below the first layer, rather an aperture in the upper layer is placed above the exposed second layer.

Chen, as well as a combination of Hiroi, Sawahata and Chen do not disclose a method or system as claims in any claims of 1-18, neither one of these publications discloses illuminating a first and second (buried) feature and determining overlay errors, neither one of these publications or a combination thereof discloses illuminating a object that includes a first and second (buried) features, where the second feature affects that shape of an area of a first layer.

In order to establish a prima facia case of obviousness three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable

expectation of success must both be found in the prior art, and not based on applicant's disclosure. In re Vaeck, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

The applicant claims that the examiner failed to establish a prima facia case of obviousness, and especially failed to provide suggestion or motivation to combine these references. The mere fact that these applications mention a scanning electron microscope does not provide a prima facia of obviousness.

The rejection of claims 5 and 10 is improper

The examiner argued that "Chen discloses all the limitations of claims 1-18 but fails to teach the use of a preliminary, as recited in claims 5 and 10. However, Hiroi (365) disclosed pre-charging the sample surface to improve image resolution in an electron beam inspection apparatus (See: Column 13, line 26-56). Hiroi discusses a manner of preventing charge-up: "*In accordance with the present invention, therefore, charge-up is first prevented from occurring as far as possible at least in a pattern located in the upper layer*" (Hiroi, column 13, lines 31-33).

Claims 5 and 10 describe pre-charging a second feature that is buried below a first layer. Hiroi does not discuss pre-charging and especially does not discuss pre-charging a feature that is buried under a first layer.

Hiroi discusses the effect of illuminating an object made of two materials. Hiroi indicates that the resolution depends upon: the yield of each material, the acceleration voltage of the scanning electron microscope, the speed of the charge-up of the object and the scan direction (Hiroi: column 12, lines 45-62, lines 4-28; column 13, lines 32-65). Thus, Hiroi merely suggests to adjust these parameters (especially acceleration voltage) during the scan of the object but does not suggest to perform a pre-charging stage.

The rejection of claims 2,7,11-14, 16 and 18 is improper

The applicant argues that the combination of Chen and Sawahata is improper.

U.S patent application serial number 10/691,746 uses small angle collection in order to detect small bumps (that represent the affect of the second buried feature on the first layer) that are much smaller than the first and second features (see: paragraph 0066):

The electrostatic field attracts the secondary electrons emitted from the first layer, and especially from an area of the first layer that is affected by the second feature. Usually, the first layer surface is deformed as a result of the second layer. For example, an ideally planar area of the first layer will include bumps positioned above the second pattern. These bumps are usually

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much smaller than the first and second feature and cannot be detected by usual top-view inspection. On the other hand, the edges of the bumps can be detected by collecting electrons at small angles in relation to the first layer. In a sense such a detection resembles "dark field" detection schemes that are very sensitive to scattered radiation.

Sawahata does not disclose overlay measurements or an overlay error correction system.

Chen discloses an overlay error correction system. It does not discuss collecting electrons from small angles, because it images relatively noticeable features (an illumination of a single collection mark may result in multiple sample alignment signals) and it can use normal or almost normal illumination and collection. Chen does not need to detect very small features, thus there is no motivation to combine Chen and Sawahata so that Chen will include small angle detection as Chen.
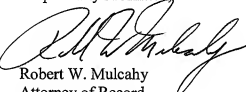
Chen does not inspect such an inspected object, thus there is not motivation to combine Chen with Sawatha.

Applicants respectfully request consideration of the amendments and the allowance of claims 1-18, thereby placing the application in condition for allowance. Should issues remain that might be subject to resolution through a telephonic interview, the Examiner is requested to telephone the undersigned at (512) 996-6839.

Respectfully submitted,

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